

Device and method for applying a marking to a knitted garment, such as tights or the like

Description

Technical field

5       The present invention relates to a device for applying a marking to a knitted garment, such as and in particular tights or another garment with a body and possibly two legs.

      The invention also relates to a method for applying a marking to a garment of the aforesaid type.

10   State of the art

      In the production of knitted garments such as tights or similar garments, including a body having an elastic waistband, a high degree of automation has currently been achieved. Normally, to manufacture tights two tubular semi-finished knitted products are produced on circular knitting machines. These two semi-finished products are then connected to each other by partially cutting their initial portion in proximity to the waistband. The product thereby obtained is subjected to dyeing, inspection to check that there are no defects, a setting phase and then packaging. The incidence of labour in this type of processing is relatively limited. The current tendency is towards increased automation and a progressive decrease in the incidence of labour, in view of the need to reduce the cost of the finished product.

      In the production of articles of manufacture and garments of this type, in particular in the manufacture of tights, it would be convenient for the finished to be provided with a marking which does not alter the aesthetic appearance of the garment. The marking would, for example, be useful to distinguish an original product from a counterfeit product. However, the application of marking should not adversely affect the cost of the finished product.

      Currently there are no known methods or devices capable of applying, in an entirely automatic way and without the use of labour, markings of this type to knitted garments, such as tights or the like, in a position that is not visible when the garment is worn.

**BEST AVAILABLE COPY**

Objects and summary of the invention

A first object of the present invention is to produce a method whereby a marking is applied automatically and without the use of labour on a garment of this type.

5        This and other objects and advantages, which shall be apparent to those skilled in the art by reading the text hereunder, are attained in substance with a method whereby said marking is applied on the inside of said garment, in proximity to the waistband of the garment.

10        According to a particular advantageous embodiment of the invention, the method uses a heat-transfer procedure to apply the marking.

To correctly apply the marking, for example the transfer, in a particularly advantageous embodiment of the invention the method includes the following steps:

- inserting the garment on a template;
- 15        • raising a portion of the waistband of the garment from the template;
- applying the marking to the internal surface of the garment at the raised portion of waistband;
- removing the garment from the template.

20        Advantageously, the template may be a setting template, of the type normally used to finish tights or similar knitted manufactured products. Ironing machines equipped with templates that may be utilized for this purpose are known and described for example in USA patent 5.094.371 and in British patent application number 2.131.465. By applying the marking when the garment is inserted on the setting template an extremely accurate and clean  
25        marking is attained, during a phase which is in any case present in the production cycle, and therefore with no increase in the production cost of the manufactured product.

30        According to a possible and advantageous embodiment of the invention, the method includes the phases of: positioning a pair of clamps next to said template; translating the clamps along said template to intercept the waistband of the garment; engaging the waistband of the garment with said clamps; moving the clamps away from the template, to detach a portion

of the waistband of the garment from it; partially overturning said portion of waistband around a section over which the waistband is pulled by said clamps; applying the marking to said portion of waistband; releasing the waistband of the garment.

5           A further object of the present invention is to produce a device to apply a marking to a knitted garment, of the type comprising a body and possibly two leg portions, for example tights or the like. Characteristically, according to the invention, this object is attained with a device comprising elements to engage the waistband of the garment, which engage a portion of the  
10 waistband of the garment and cause it to partially overturn, exposing the internal surface of the waistband to a marking element.

In a possible and advantageous embodiment of the invention, the marking element is a heat transfer element for a transfer, and comprises a heated pad co-acting with a pressing surface.

15           In a possible embodiment the engaging elements comprise a pair of clamps which grasp the waistband of the garment in two spaced out points to overturn it partially. To attain partial overturning of a portion of the waistband of the garment between the points in which it is gripped by the clamps a section is provided positioned between the two clamps, around which the  
20 portion of waistband of the garment engaged between said clamps is at least partially overturned through relative movement between the section and the clamps.

To attain a particularly compact device, the section positioned between the clamps is associated with the pressing surface with which the heated pad  
25 of the marking element cooperates. Advantageously, the section and the pressing surface may be produced from a single component.

To attain an effective grip on the waistband of the garment without damaging it, each of the clamps may advantageously comprise a first engaging element for the waistband of the garment and a second engaging  
30 element, which may be constituted by a cylinder or other insert in elastomeric material, against which the garment is pressed by the first engaging element.

Further advantageous characteristics and embodiments of the method and of the device according to the invention are indicated in the attached dependent claims and shall be further described with reference to a preferred although non-limiting example of embodiment of the invention.

5 Brief description of the drawings

The finding shall now be better understood by following the description and attached drawing, which shows a non-limiting practical embodiment of the invention. More particularly, in the drawing:

figure 1 shows an overall side view and partial section of the device  
10 according to the invention;

figure 2 shows a view according to II-II in figure 1;

figure 3 shows a side view of a clamp;

figure 4 shows a bottom view according to IV-IV in figure 1;

figure 5 shows a section according to a vertical plane of the assembly  
15 carrying the clamps and the marking element in the initial position of the marking cycle, after engaging the waistband of the garment inserted on the setting template;

figure 5A shows the same section as figure 5, in a phase immediately  
subsequent to the one shown in figure 5;

20 figure 6 shows a view according to VI-VI in figure 5;

figure 7 shows a section according to VII-VII in figure 5;

figure 8 shows a side view of the clamps in the closed position, which  
they adopt in the phase subsequent to the one shown in figures 5, 6 and 7;

figure 9 shows a section analogous to the section in figure 5 in a  
25 position in which the clamps are moved back in relation to the pressing template to perform partial overturning of a waistband portion of the garment;

figure 10 shows a view according to X-X in figure 9;

figure 11 shows a section according to XI-XI in figure 9;

figure 12 shows a section analogous to the section in figure 9 in a  
30 subsequent phase of the marking cycle;

figure 13 shows a view according to XIII-XIII in figure 12;

figure 14 shows a section according to XIV-XIV in figure 12;

figure 15 shows a section analogous to the section in figure 12 in a subsequent phase of the marking cycle;

figure 16 shows a view according to XVI-XVI in figure 15;

figure 17 shows a section according to XVII-XVII in figure 15;

5 figure 18 shows a section analogous to the section in figure 15 in another subsequent phase of the marking cycle;

figure 19 shows a view according to XIX-XIX in figure 18; and

figure 20 shows a section according to XX-XX in figure 18.

Detailed description of the preferred embodiment of the invention

10 The device, indicated as a whole with 1, is shown fully in figure 1. It is positioned at a station of a machine to finish tights, for example a machine of the type disclosed in one of the patents quoted hereinbefore. These machines are of a per se known type and are not illustrated herein. Figure 1 shows solely and schematically a setting template, indicated with S, on which a  
15 garment is inserted on the waistband of which the marking or transfer is to be applied.

The device 1 is positioned adjacent to one of the positions in which the setting templates S stop to interact with the garment inserted on the template S which each time stops in the position in which the device 1 is positioned.

20 The device 1 comprises, on a base 3, an upright 5, extending along which are two guides 7 and 9 for corresponding runners 11 and 13. The runners 11, 13 are integral with a moving unit 15 designed to translate vertically according to the double arrow f15 along the upright 5. The vertical movement of the moving unit 15 is controlled by means of a motor 17 and a  
25 threaded bar 19 on which a nut screw 21, integral with the moving unit, engages.

The moving unit 15 carries an assembly 23 which comprises, as shall be described in greater detail hereunder, engaging elements for the waistband of the garment inserted on the setting template S, and a marking  
30 element and pressing or contrast surface for said marking element. The assembly 23 is provided as a whole with a movement to move near to and move away from the setting template S maintaining the unit 15 at a standstill.

This moving near to and moving away from movement is controlled by a piston-cylinder actuator 25 integral with a plate 27 which forms the main body of the moving unit 15 and with which the runners 11, 13 are also integral. From the position shown in figure 1 the assembly 23 may be moved close to the setting template S without translating the moving unit 15 vertically, by  
5 extending the piston-cylinder actuator 25. In this movement, the assembly 23 is guided by a runner 28 integral with it and sliding along a guide 30 integral with the plate 27.

The assembly 23 comprises the engaging elements for the waistband  
10 of the garment inserted on the setting template S. As shown in particular in figures 3 and 4, the engaging elements comprise a pair of clamps 37 carried by a slide 33 integral with a guide 35 sliding in a runner 37 which is part of the assembly 23 and anchored to a plate 39 rigidly anchored to the rod of the piston-cylinder actuator 25 which controls the moving near to and moving  
15 away from movement of the assembly 23 in relation to the setting template S in the direction f23.

Each clamp 31 comprises a first element 41 to engage with the waistband of the garment, equipped with an idle roller 42. Each element 41 has a pointed form to be inserted easily between the surface of the setting  
20 template S and the garment inserted on this. The first element 41 with the respective roller 42 of each clamp 31 is positioned against the setting template S when the assembly 23 is moved towards the setting template S controlled by the actuator 25.

The first element 41 cooperates with a second element 43 with which  
25 each clamp 31 is equipped. This second element 43 is constituted by an insert in relatively soft elastomeric material, for example in the form of a small cylinder, with the purpose of holding the waistband of the garment when the clamp closes without damaging the garment. The opening and closing movement of each clamp is controlled by a respective actuator 45 anchored  
30 to a slider on which the first element 41 of the clamp is formed.

The clamps are anchored to a common slide 47, running along guides 49. The slide 47 runs along the guides 49 controlled by a piston-cylinder

actuator 51 mounted on the slide 33. The number 53 indicates an adjustable stop which defines the limit stop position of the slide 47 and therefore of the clamps anchored to it. Positioned between the two clamps 31 is a section 55 rounded at the front and which forms at the bottom a seat for an insert in elastomeric material 57 with a flat surface, which forms a pressing surface or contrast surface for a heated pad 59 which constitutes the actual marking element. The section 55 and the insert in elastomeric material 57 are integral with the plate 39.

Also anchored to the plate 39 is a cylinder 60 of a piston-cylinder actuator 61 which controls, as shall be explained hereunder, the movements of the various elements of the assembly 23 in a direction coinciding with the direction f23 of movement of the assembly as a whole in relation to the setting template S. The rod 63 of the piston-cylinder actuator 61 is connected, by means of interposition of a compression spring 65, to a slider 67 running in relation to the plate 39 according to the arrow f67, guided in bushings 68 by means of guide bars 70.

Integral with the slide 33 is a guide bar 69 around which a compression spring 71 is arranged, which reacts between the slide 33 and a spacer 73 inserted around the guide bar 69 and resting on the slider 67, which has a hole through which the bar 69 passes. At the lower end of the bar 69 is a stop 74, against which the slider 67 rests through the effect of the compression spring 71.

The plate 39, with which the cylinder 60 of the piston-cylinder actuator 61 is integral, forms a stop 75 against which the slide 33 stops when it is thrust by the piston-cylinder actuator 61 through the restraint formed between the slide 33 and the rod 63 of the actuator 61 by the slider 67, the spacer 73 and the spring 71. Extension of the actuator 61 therefore causes, as a first effect, a movement of the slider 67 and of the slide 33 with the elements connected to it, namely the guides 49, the slide 47, the actuator 51 and the clamps 31.

Connected to the slider 67 are two guide bushings 81 inside which two guide bars 83 are engaged slidingly, around which compression springs 85

are positioned. The compression springs 85 react between the slider 67 and a crosspiece 89 integral with the guide bars 83 and carrying four idle guide rollers 91, 92, 93 and 94 for a strip N bearing the transfers to be transferred onto the garment. The strip N is unwound from a roll R1 and rewound on a roll R2 of spent strip. The two rolls are carried by the plate 27 forming the main body of the moving unit 15 and therefore follow its movement. Along the path for unwinding from the roll R1 and rewinding on the roll R2 the strip N passes through a sensor 98 which reads references produced on the strip to position the various transfers at the transfer element. The sensor 98, for example an optical sensor, thereby causes a motor 96 to start and stop, to unwind the strip N from the roll R1 and rewind it on the roll R2, to have said strip perform a step, corresponding to the marking or transfer, for each garment to be marked.

The rollers 92 and 93 carried by the crosspiece 89 are positioned against two surfaces 97 integral with the slide 33 and movable with it. The piston-cylinder actuator 61 causes, as it continues in its travel beyond the position in which the slide 33 comes into contact with the stop 75, the movement of the crosspiece 89 towards the contact surfaces 97 to cause the strip N to be clamped against these surfaces.

Integral with the slider 67 are uprights 101 connected rigidly to the heated pad 59. This pad is heated internally by means of an electrical resistor, not shown. It is positioned against the elastomeric insert 57 which remains fixed in relation to the bracket or plate 39 during the entire movement of the remaining elements controlled by the piston-cylinder actuator 61. The compression spring 65 positioned between the slider 67 and a stop 109 integral with the rod 63 of the piston-cylinder actuator 61 makes the pressure of the pad 59 against the surface defined by the insert 57 gradual. The compression springs 85 allow the slider 67 to be raised above the stop position of the crosspiece 89 to carry the heated pad 59 to be positioned against the pressure surface defined by the elastomeric insert 57.

The device described hereinbefore performs, for each garment to be marked, a cycle described hereunder with reference to the sequence of



positions shown in the figures 5 to 20. The garment T is shown only in a few of the figures for greater clarity of the drawing.

Starting from the position shown in figure 1, in which the clamps 31 are in a position detached in relation to the setting template S, the assembly 23 is made to advance according to the arrow f23 to carry the clamps 31 to be positioned against the template, in a position below the position of the waistband of the garment inserted on the setting template. The moving unit 15 is then gradually raised according to the arrow f15 to intercept the waistband B of the garment, indicated with I in figure 5, with the clamps 31. In order to check when the clamps 31 reach the garment I and are inserted under the waistband B thereof, a sensor, for example an optical sensor, schematically indicated with 24, is associated with the assembly 23. The sensor comprises an emitter and a receiver and detects the presence of the garment I thanks to the fact that the optical signal emitted by the transmitter is no longer reflected by the at least partially reflecting surface of the setting template S. As the sensor 24 is positioned above the clamps 31, the raising movement of the moving unit 15 is not stopped immediately after detection of the garment by the sensor 24, but this movement continues for an amount sufficient to guarantee insertion of the clamps 31, or more specifically of the element 41 of the clamps, under the waistband B of the garment. The raising movement of the moving unit 15 terminates when the unit 23 has adopted, in relation to the garment inserted on the template S, the position shown in figure 5. The various elements and mechanical parts of the assembly 23 are in the position shown in figures 5, 6 and 7 with the piston-cylinder actuator 61 fully withdrawn.

At this point the waistband B of the garment I is engaged by the clamps 31 by means of a closing movement of the clamps controlled by the respective actuators 45. The clamps close to adopt the position shown in figure 5A.

By keeping the moving unit 15 always in the same position, the subsequent movement is the one to move the portion of the elastic waistband B of the garment I away from the setting template S. This movement is

attained by means of the actuator 51 which makes the slide 47, and consequently the clamps integral with it, move away. With this movement the clamps adopt the position shown in figures 8 and 9. The portion of the waistband B of the garment I engaged between the two clamps 31 is moved  
5 away from the setting template S and drawn under the surface formed by the insert 57, with partial overturning of this portion of waistband around the section 55. In this way the internal surface of the portion of waistband B held between the two clamps is exposed towards the heated pad 59 below, and the transfer is applied to it in the manner described hereunder.

10 The subsequent gradual raising movement of the elements of the assembly 23 by means of the piston-cylinder actuator 61 causes the clamps to move away upwards in relation to the pressing surface defined by the insert 57, clamping of the strip N carrying the transfers and pressure of the heated pad 59 against the pressing surface defined by the insert 57. This movement  
15 is shown in the subsequent figures.

Figures 12, 13 and 14 show a first intermediate position reached by the assembly 23 during extending travel of the piston-cylinder actuator 61. This first stretch of travel causes raising of the slider 67, crosspiece 89 and slide 33 and all parts and elements connected rigidly to these three components.  
20 The raising movement of slide 33 and consequently of guide 49, actuator 51, clamps 31 and respective actuators to operate these clamps terminates when the slide 33 is positioned against the surface 75 integral with the plate 39. This movement removes the clamps 31 and relative actuator elements from the pressing surface.

25 Further extension of the piston-cylinder actuator 61 causes continuation of the travel to raise the slider 67 and the crosspiece 89, this travel being made possible by gradual compression of the spring 71. The raising movement of the crosspiece 89 terminates when the guide rollers 92 and 93 come to rest against the surfaces 97. The position in which the raising  
30 movement of the crosspiece 89 stops is shown in figures 15, 16 and 17. In this position a stretch of the strip N with the marking to be transferred to the garment remains clamped between the two guide rollers 92 and 93.

Compression of the springs 85 allows further raising of the slider 67 and of the pad 59 integral with said slider 67. This further raising travel terminates when the heated pad 59 is positioned to press against the pressing surface defined by the insert 57. The strip N bearing the transfers is thus pressed by the heated pad 59 against the internal surface of the overturned portion of the waistband B of the garment I, thereby allowing the transfer to be transferred to the fabric of which the garment is formed.

The piston-cylinder actuator 61 may at this point perform a withdrawing travel to return the elements forming the assembly 23 to the position shown in figs. 9, 10 and 11. The actuator 51 and the clamps 31 perform the reverse movement to the one described above and the moving unit 15 is lowered, releasing the garment and being positioned for a subsequent marking cycle.

To allow removal of the setting template S which rotates around a vertical axis and which has a certain dimension in a direction orthogonal to the surface in figure 1, the assembly 23 is made to move away in relation to said template translating on the guides carried by the plate 27 in the direction of the arrow f23 to remove the clamps 31 from the surface of the template.

It is to be understood that the drawing shows only a possible non-limiting embodiment of the invention, which may vary in its forms and arrangements without however departing from the scope of the concept on which the invention is based. Any reference numbers in the attached claims do not limit the scope of protection whatsoever and are provided for the sole purpose of facilitating reading in the light of the preceding description and the attached drawings.

Claims

1. Method for applying a marking to a knitted garment with a body having a waistband, such as tights or the like, characterized in that said marking is applied to the inside of said garment, in proximity to said waistband.
2. Method as claimed in claim 1, characterized in that said marking is applied with a heat-transfer procedure.
3. Method as claimed in claim 1, characterized by the following steps:
- 10 • inserting the garment on a template;  
• raising a portion of the waistband from the template;  
• applying said marking to the internal surface of the garment in proximity to the raised portion of waistband.
4. Method as claimed in claim 1, characterized by the following steps:
- 15 • inserting said garment on a setting template;  
• setting said garment on said template;  
• raising a portion of the waistband from the template;  
• applying said marking to the internal surface of the garment in proximity to the raised portion of waistband;
- 20 • removing said garment from the setting template.
5. Method as claimed in claim 3 or 4, characterized by: positioning a pair of clamps next to said template; translating the clamps along said template to intercept the waistband of the garment; engaging the waistband of the garment with said clamps; moving the clamps away from the template, to detach a portion of the waistband of the garment from it; partially overturning said portion of waistband around a section over which the waistband is pulled by said clamps; applying the marking to said portion of waistband.
- 25
6. A device to apply a marking to a knitted garment with a body having a waistband, such as tights or the like, characterized in that it comprises a marking element and engaging elements for the waistband,
- 30

which engage a portion of the waistband and cause it to partially overturn, exposing the internal surface of the waistband to said marking element.

7. Device as claimed in claim 6, characterized in that said marking element is a heat transfer element for a transfer, comprising a heated pad  
5 cooperating with a pressing surface.

8. Device as claimed in claim 6 or 7 characterized in that said engaging elements comprise a pair of clamps.

9. Device as claimed in claim 8, characterized in that a section is positioned between said pair of clamps, around which the portion of  
10 waistband of the garment engaged between said clamps is at least partially overturned by the relative movement between said section and said clamps.

10. Device as claimed in claim 7 and 9, characterized in that said section is associated with said pressing surface.

11. Device as claimed in claim 10, characterized in that said clamps  
15 are equipped with a translating movement parallel to said pressing surface.

12. Device as claimed in one or more of claims 9 to 11, characterized in that said clamps are equipped with a first closing movement controlled by respective closing actuators and a second translating movement in relation to said section.

20 13. Device as claimed in one or more of claims 8 to 12, characterized in that each of said clamps comprises a first engaging element for the waistband of the garment and a second contrast element, the waistband of the garment being clamped between said first and said second element.

25 14. Device as claimed in claim 13, characterized in that said second element of each clamp is constituted by a cylinder in elastomeric material.

15. Device as claimed in one or more of the claims from 6 to 14, characterized in that said engaging elements for the waistband of the garment and said marking element are supported by a moving unit along a  
30 substantially vertical upright.

16. Device as claimed in claims 7 and 15, characterized in that said unit carries means to support and unwind a strip carrying the transfers to be transferred to said garment.

17. Device as claimed in claim 15 or 16, characterized in that the movement of said moving unit along said upright is controlled by a raising and lowering actuator, the movement of which is controlled by a sensor which detects the position of the waistband of the garment.

18. Device as claimed in one or more of the claims from 15 to 17, characterized in that said moving unit carries an assembly carrying said engaging elements and said marking element, said assembly being movable in relation to said unit in an inclined direction in relation to the direction of movement of the unit along the upright.

19. Device as claimed in claims 7, 8, 9, 16 and 18, characterized in that said assembly carries said clamps, said section, said pressing surface and said heated pad and at least a pair of guide rollers for said strip.

20. Device as claimed in claim 19, characterized in that at least a first actuator to position said pair of guide rollers against clamping stops of the strip bearing the transfers and to press the heated pad against the pressing surface is associated with said assembly.

21. Device as claimed in claim 19 or 20, characterized in that said assembly comprises a plate to which said at least one actuator is anchored and running on which are a first slide carrying said clamps, a second slide carrying said heated pad and guide means for a third slide carrying said at least one pair of guide rollers.

22. Device as claimed in claim 21, characterized in that said assembly and said first actuator are movable in relation to said moving unit movable along the vertical upright, a second actuator being provided to translate said assembly in relation to said moving unit.

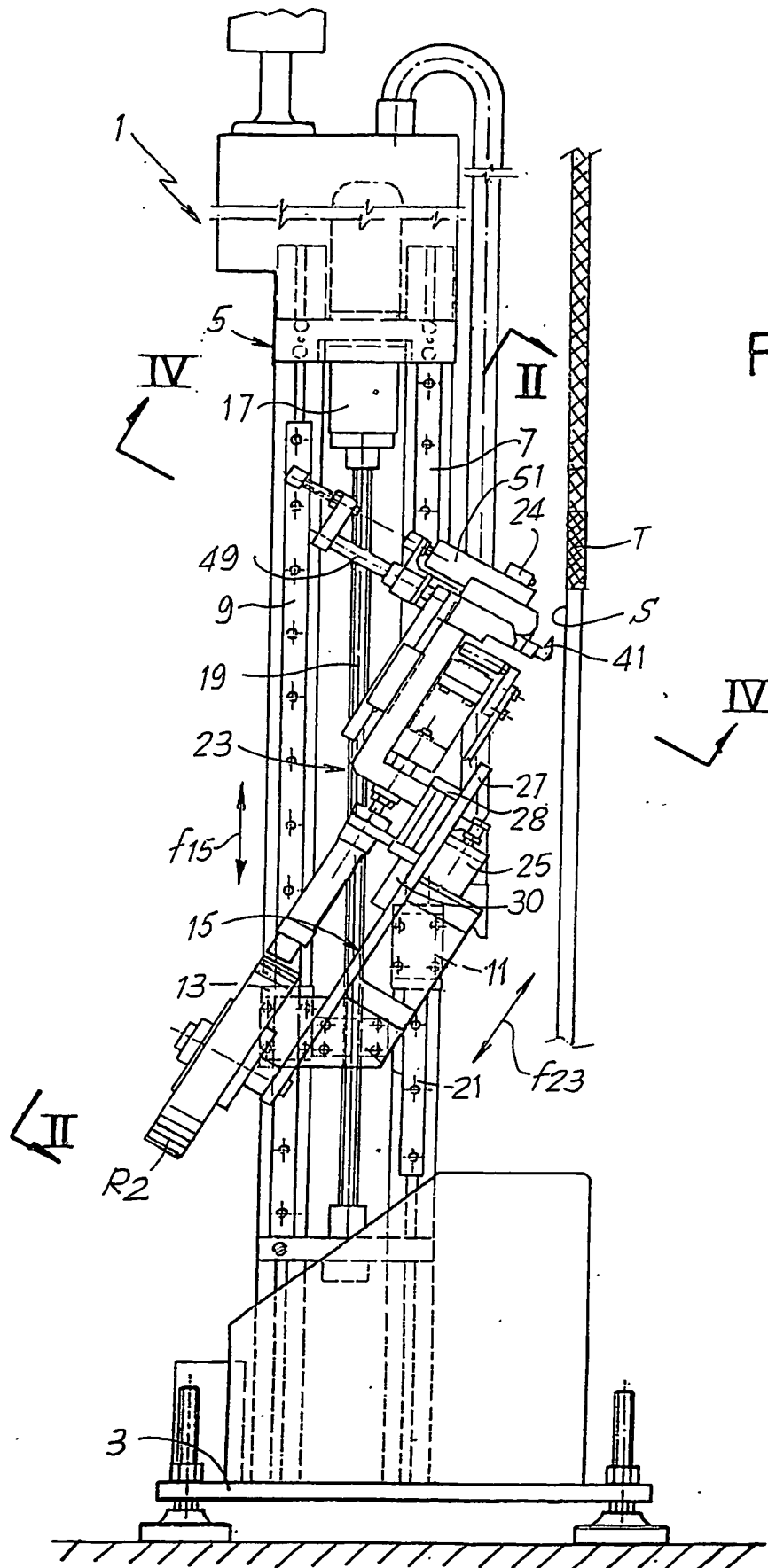
23. A finishing machine for knitted garments, such as tights and the like, comprising a carousel with a plurality of setting templates, which are translated in sequence along successive work stations, characterized in that it

comprises a device according to one or more of the claims from 6 to 22, associated with one of said stations.

24. A knitted garment comprising a waistband, characterized by a marking applied internally to the garment along its waistband.

5        25. Knitted garment as claimed in claim 24, characterized in that said marking is a transfer.

26. Knitted garment as claimed in claim 24 or 25, characterized in that it is tights.





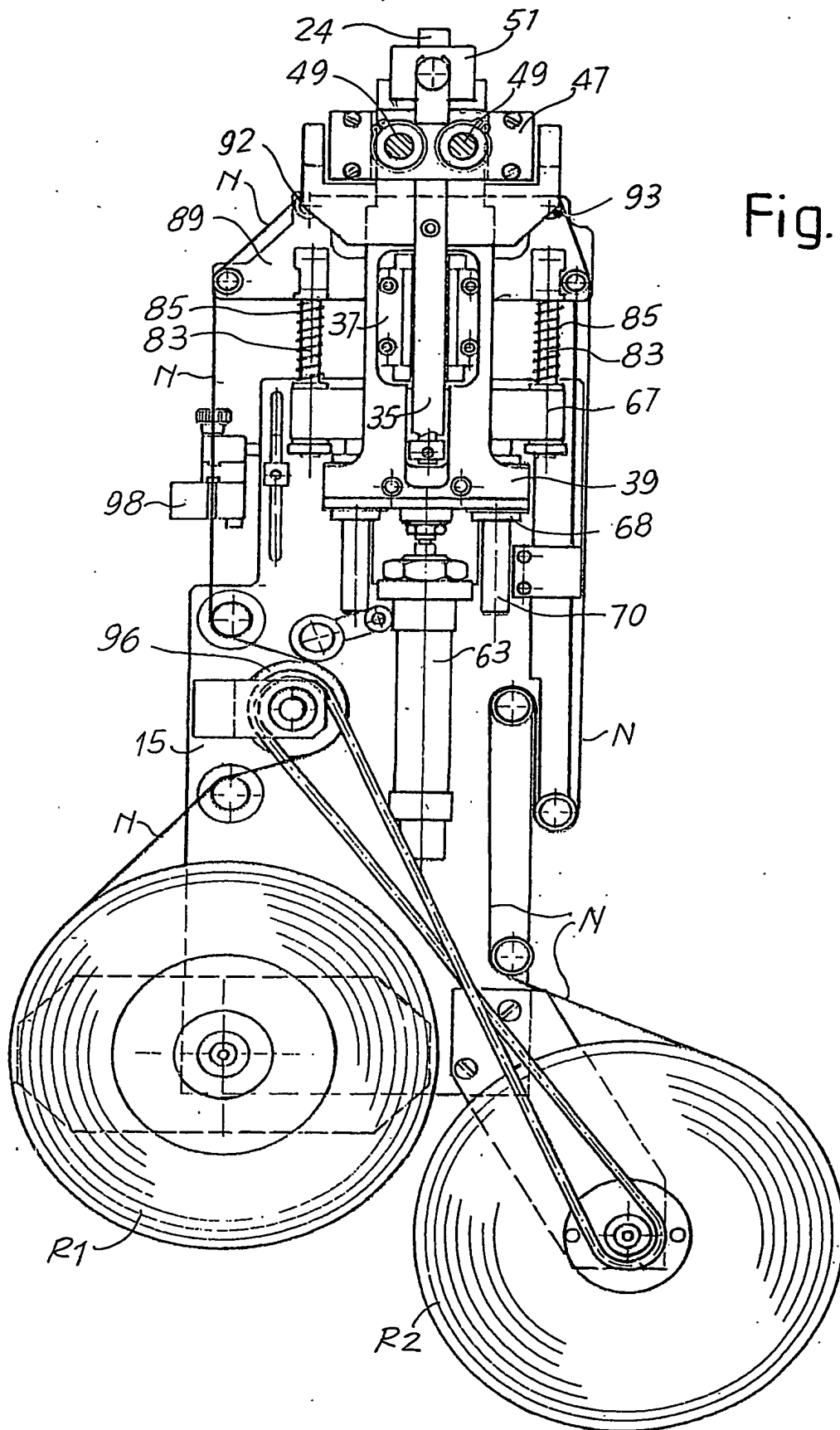


Fig. 3

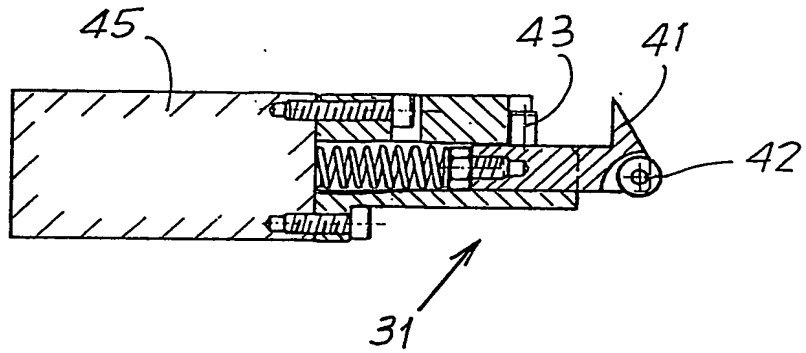


Fig. 4

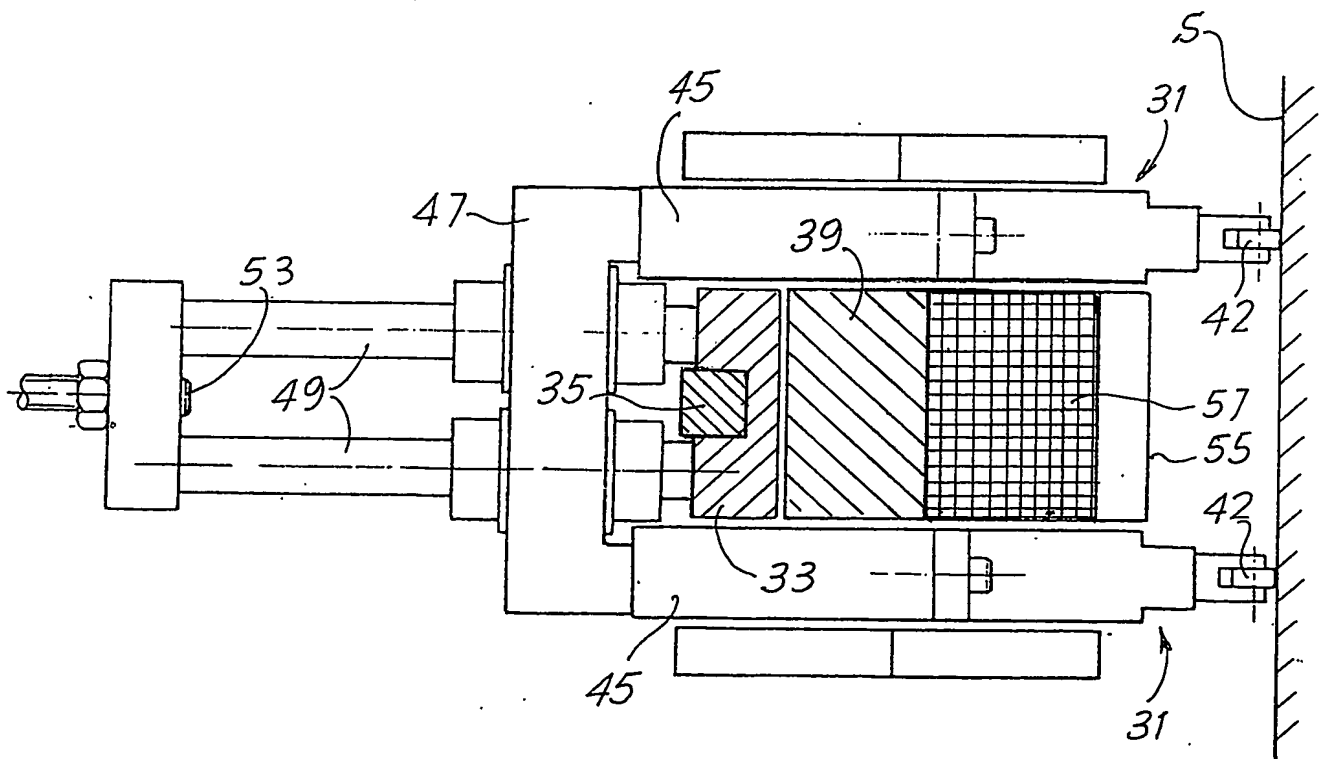


Fig. 5

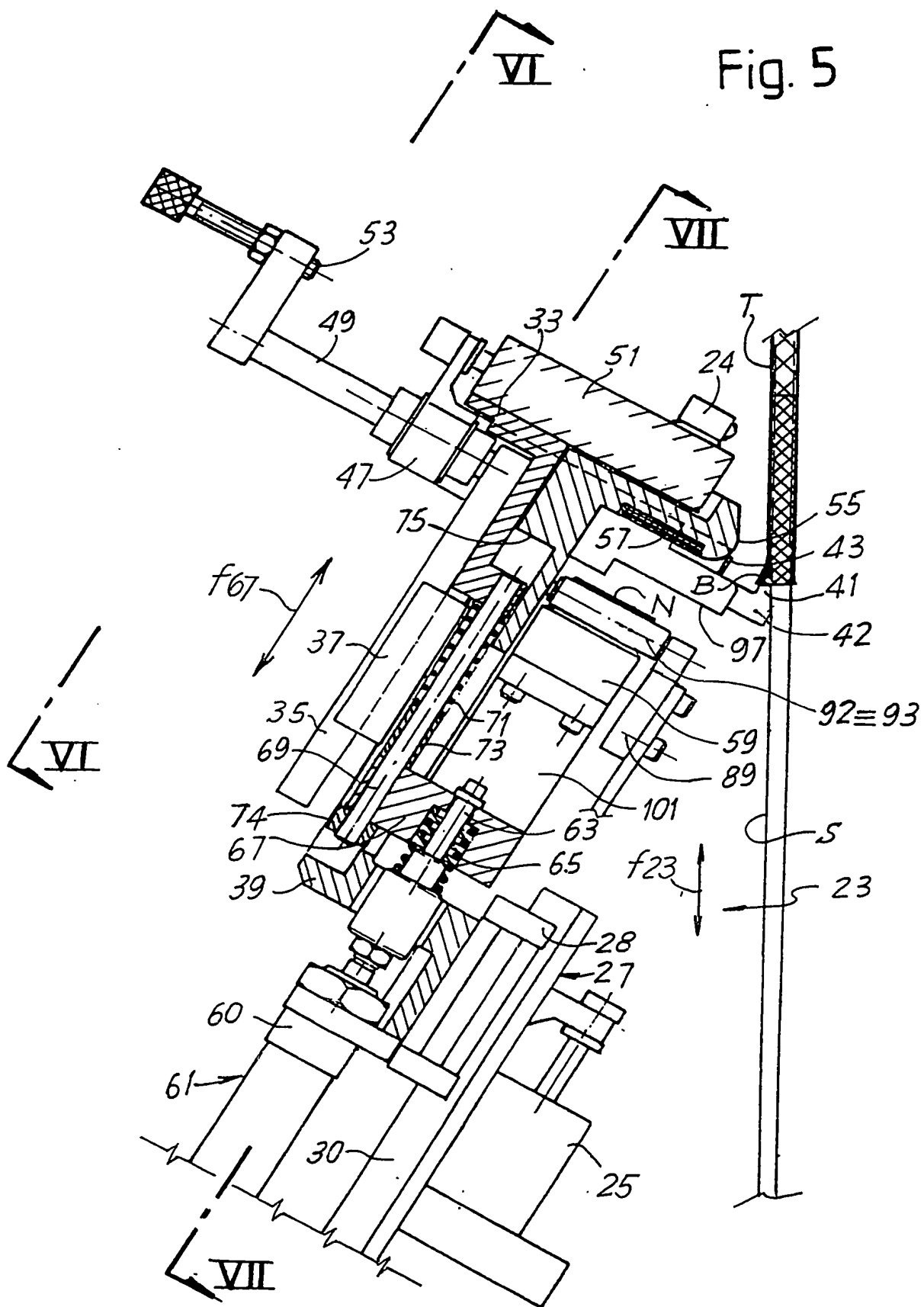
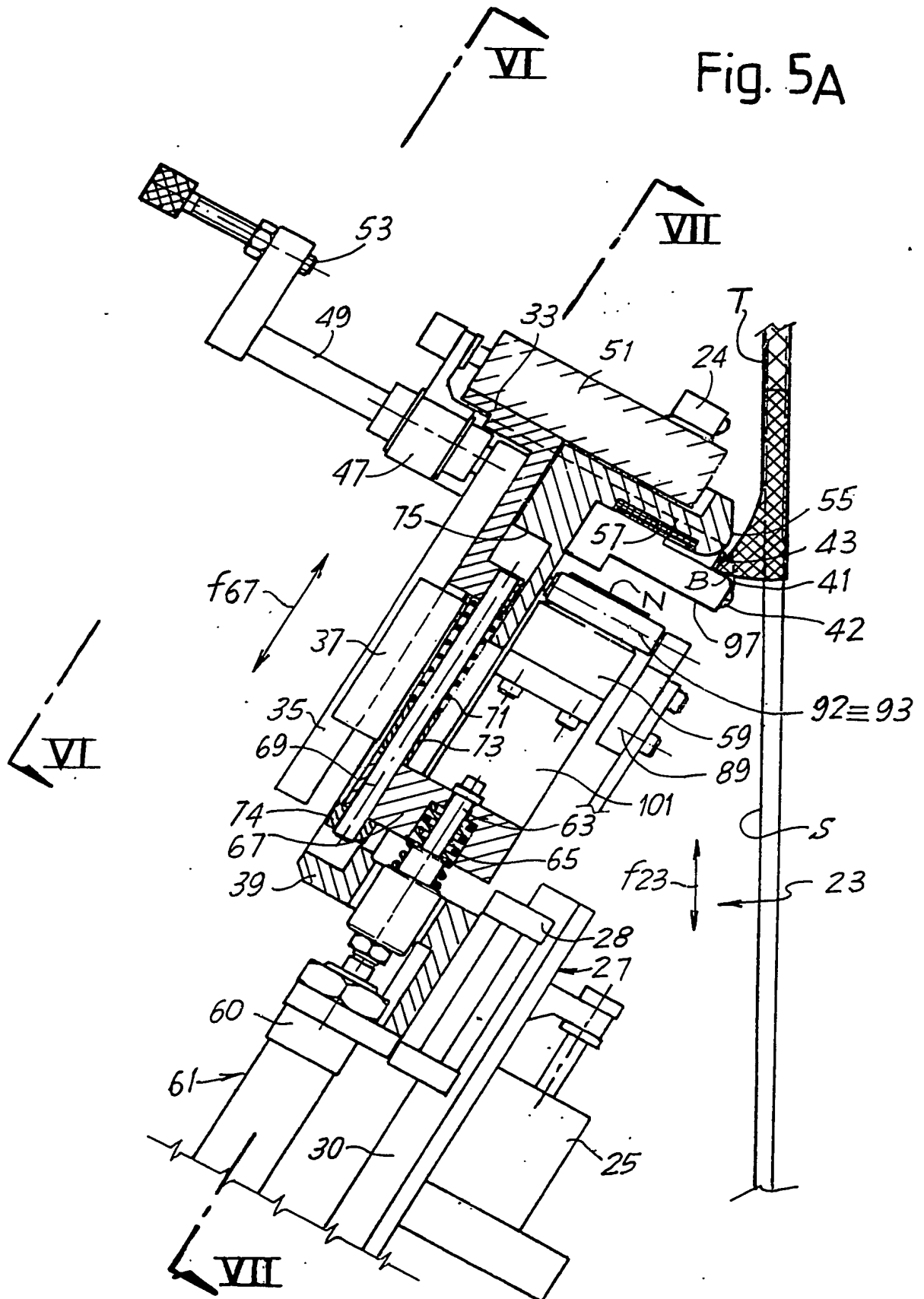


Fig. 5A



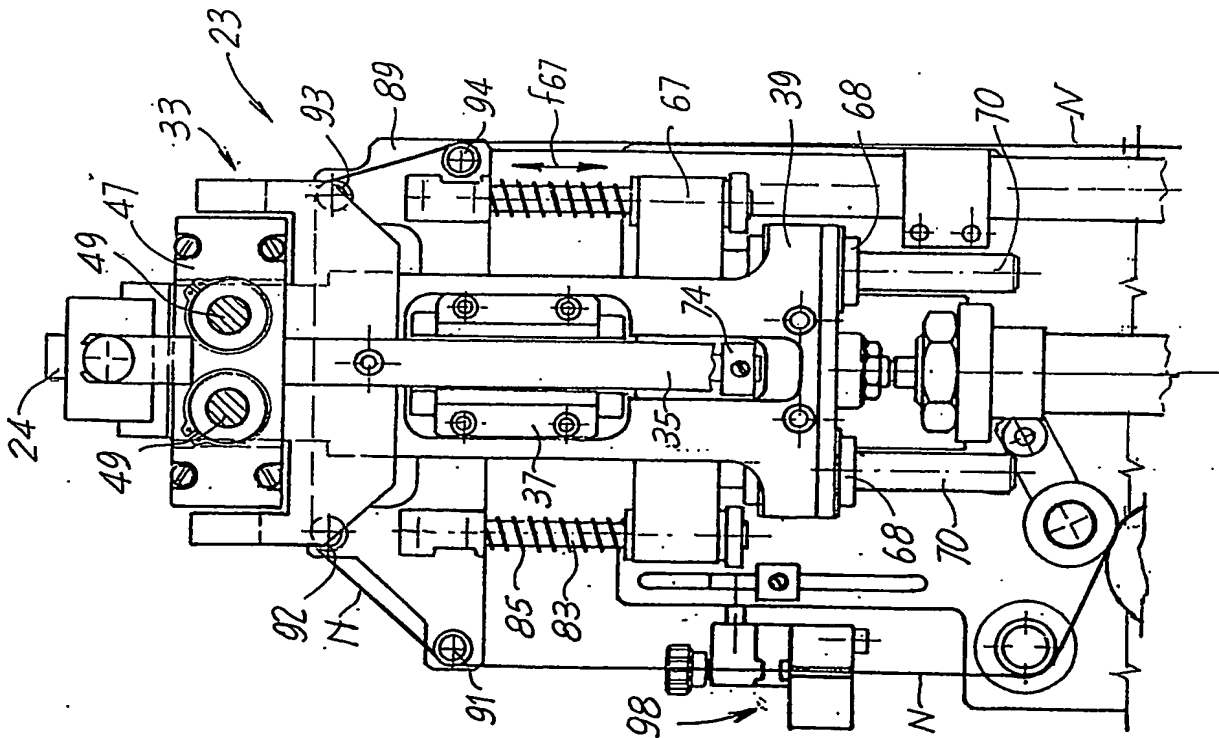


Fig. 6

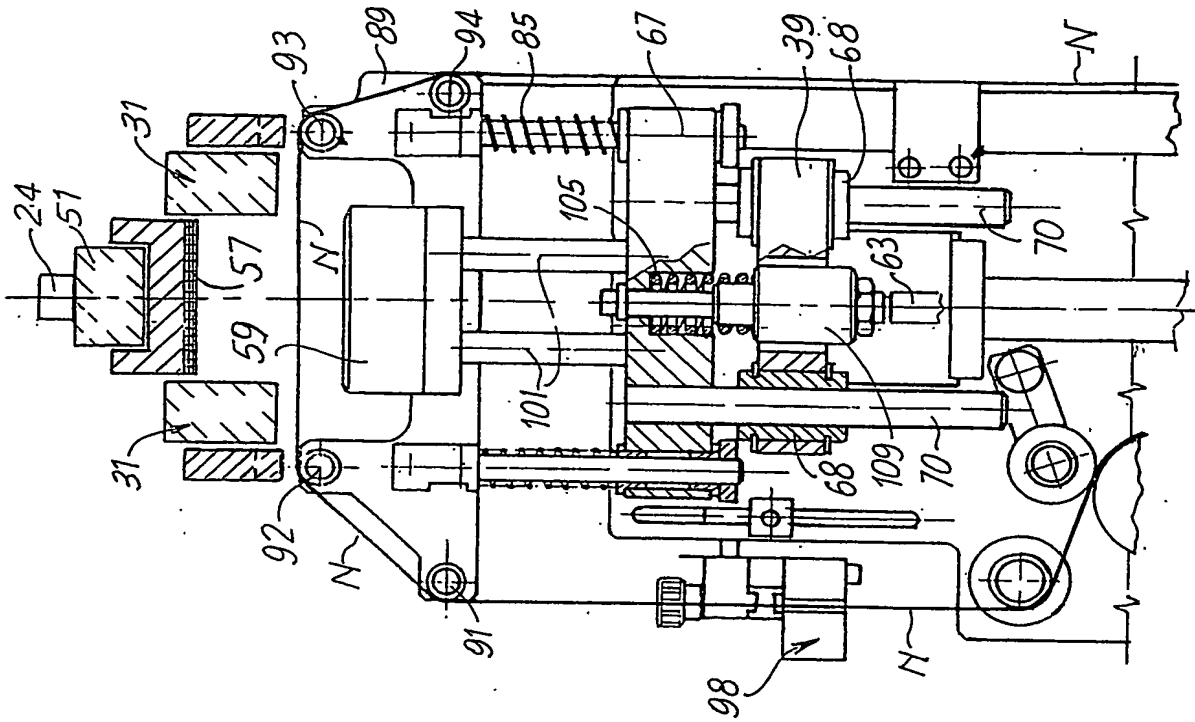


Fig. 7

Fig.8

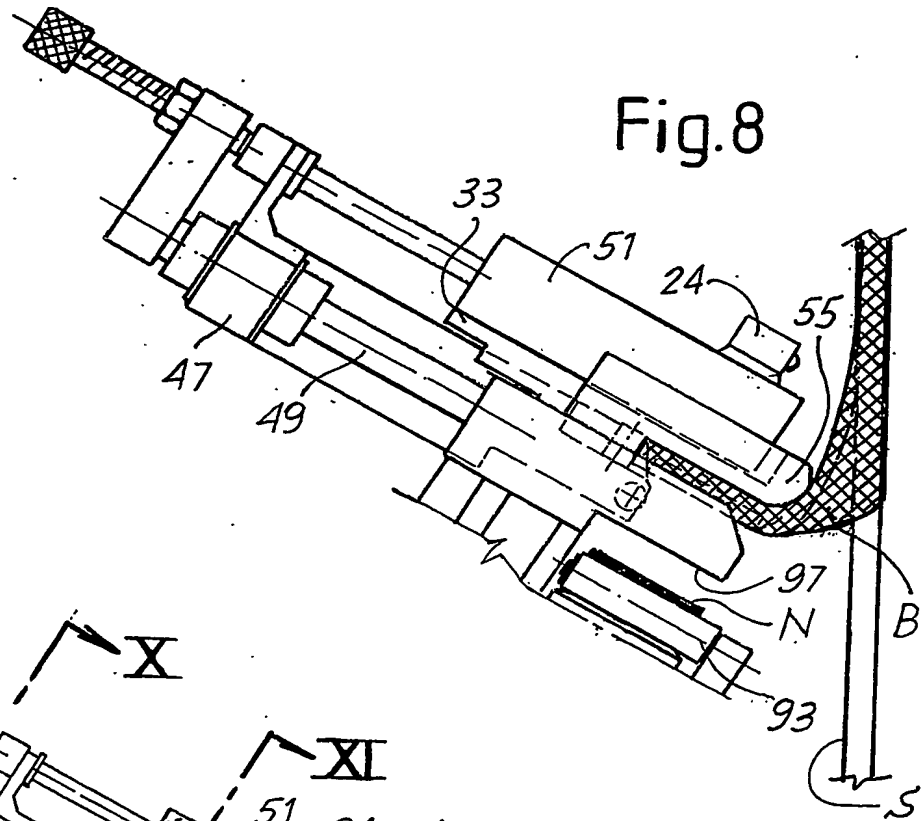
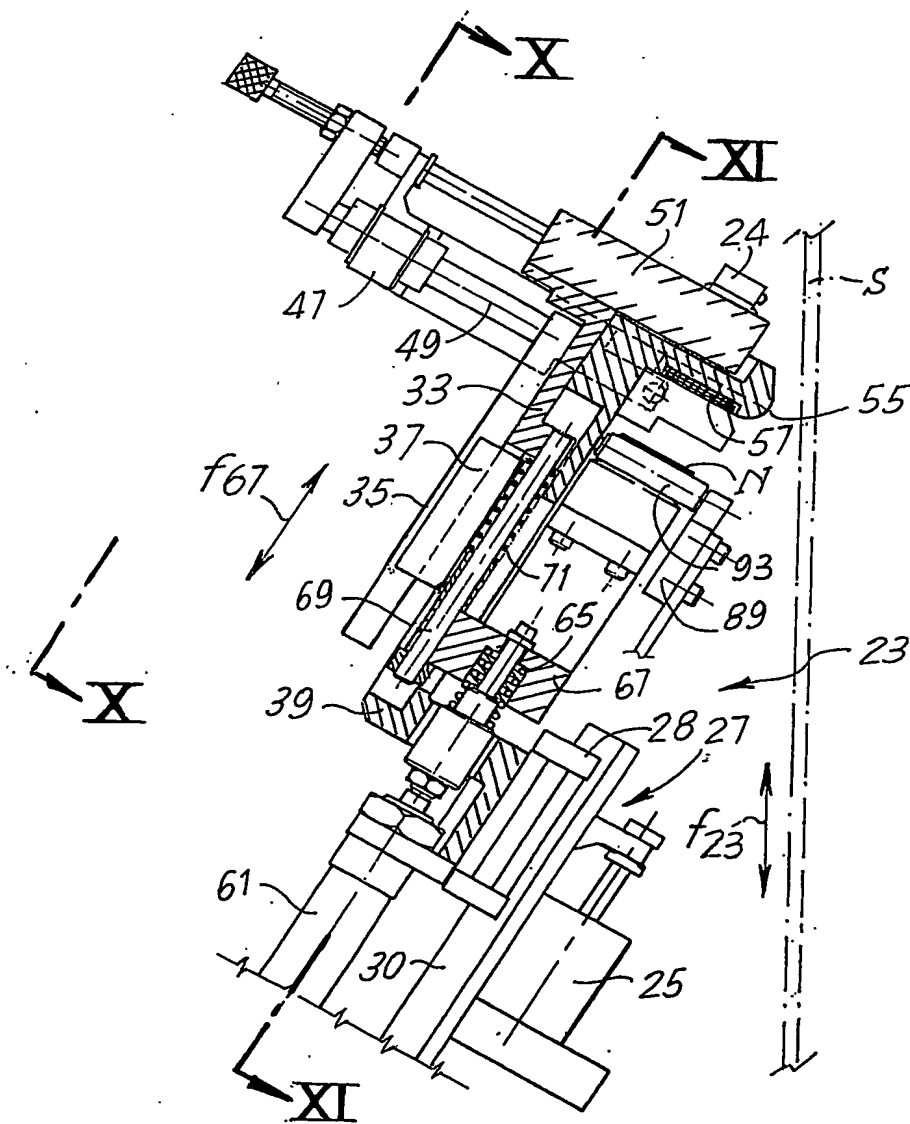


Fig.9



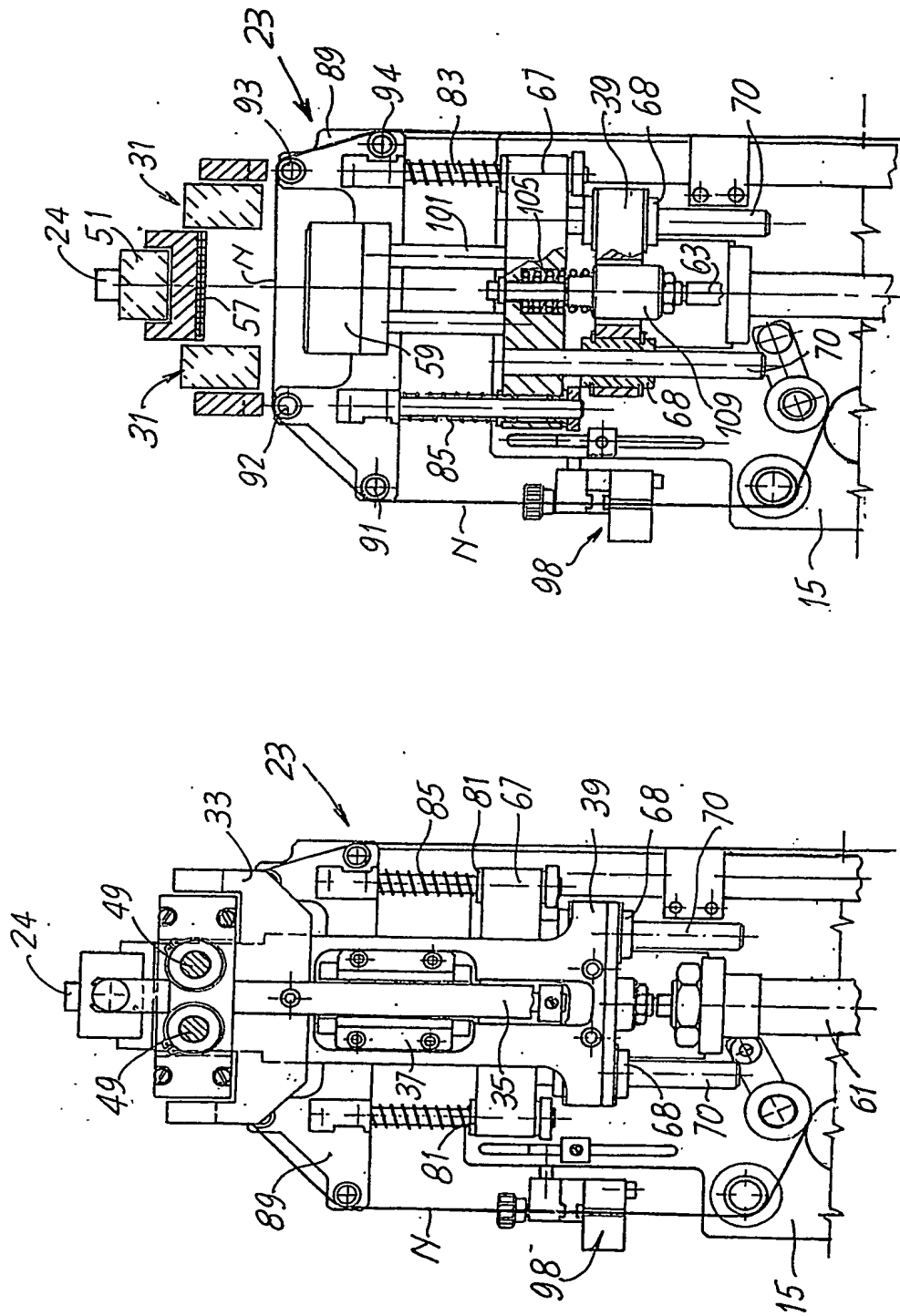


Fig. 10

Fig. 11

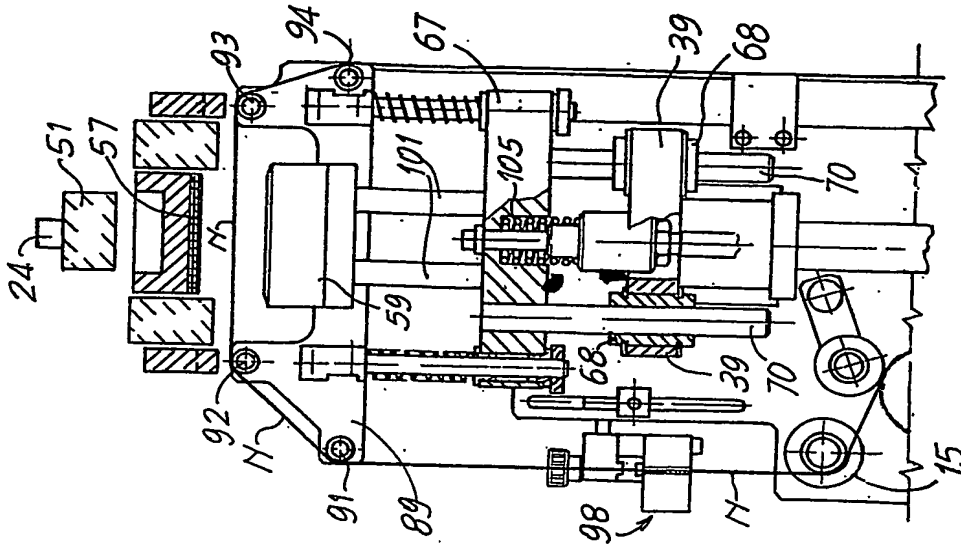


Fig. 14

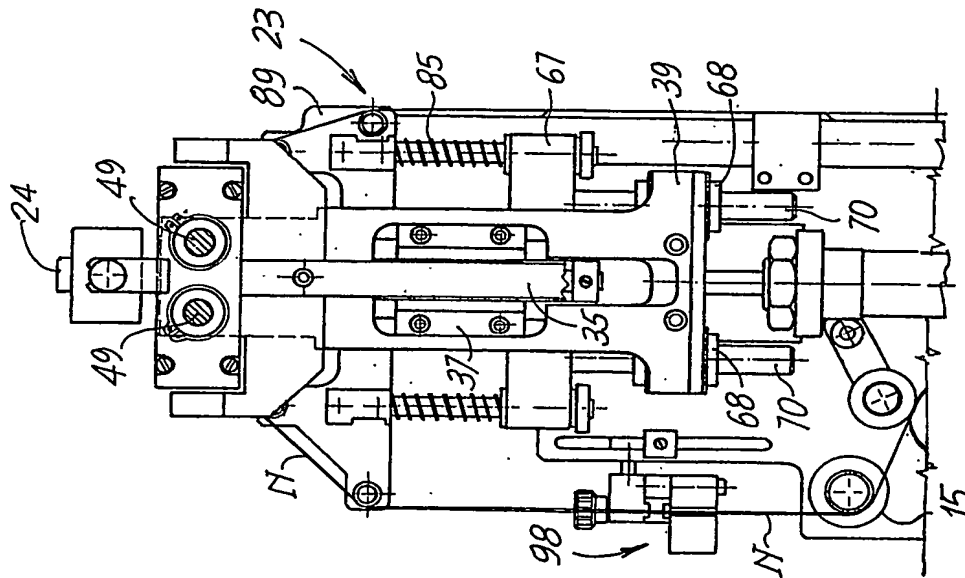


Fig. 13

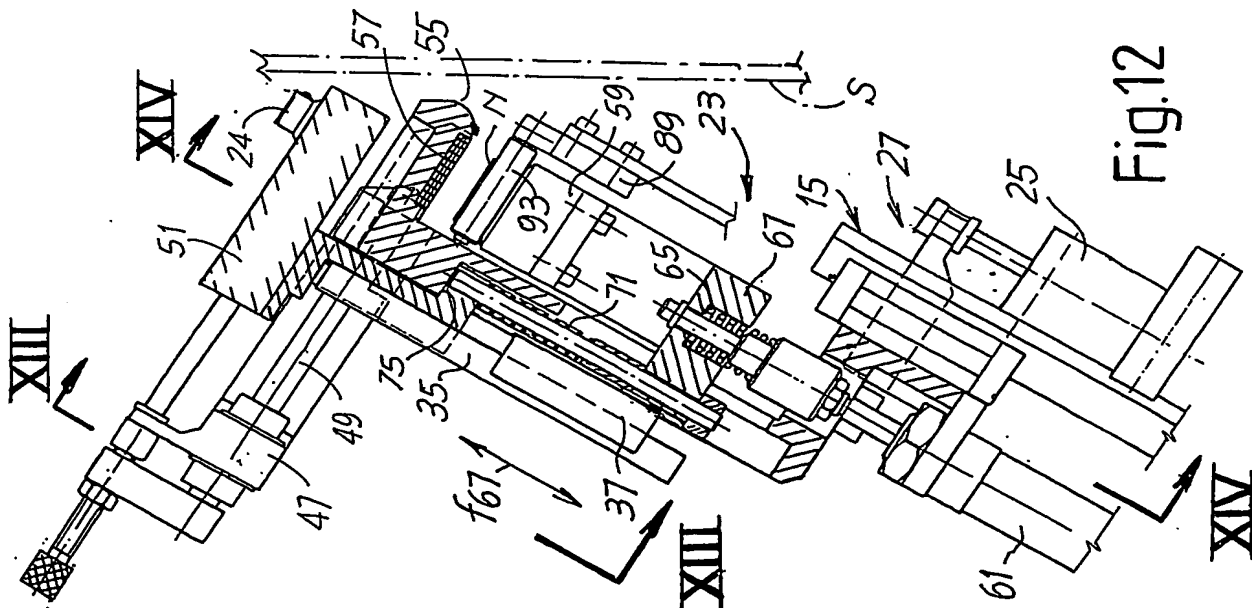


Fig.12



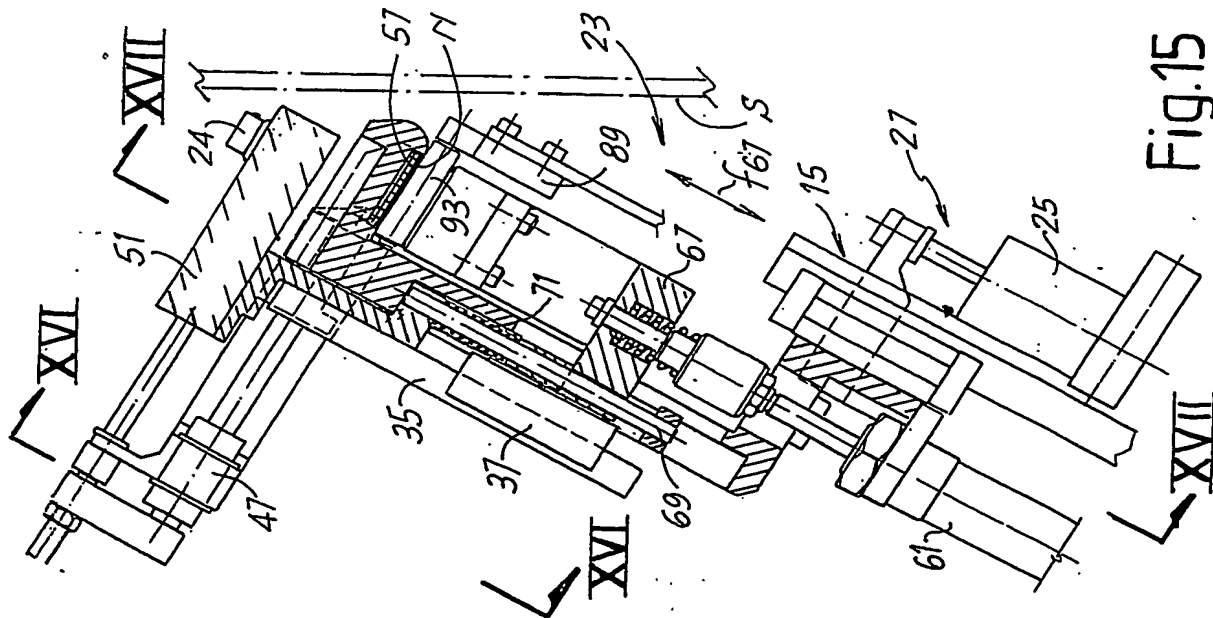


Fig.15

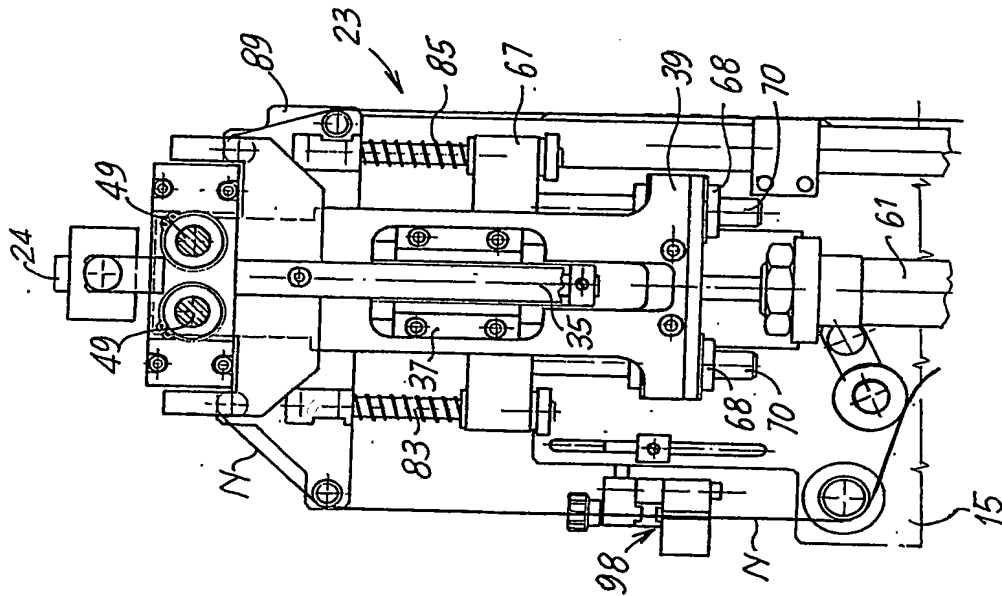


Fig.16

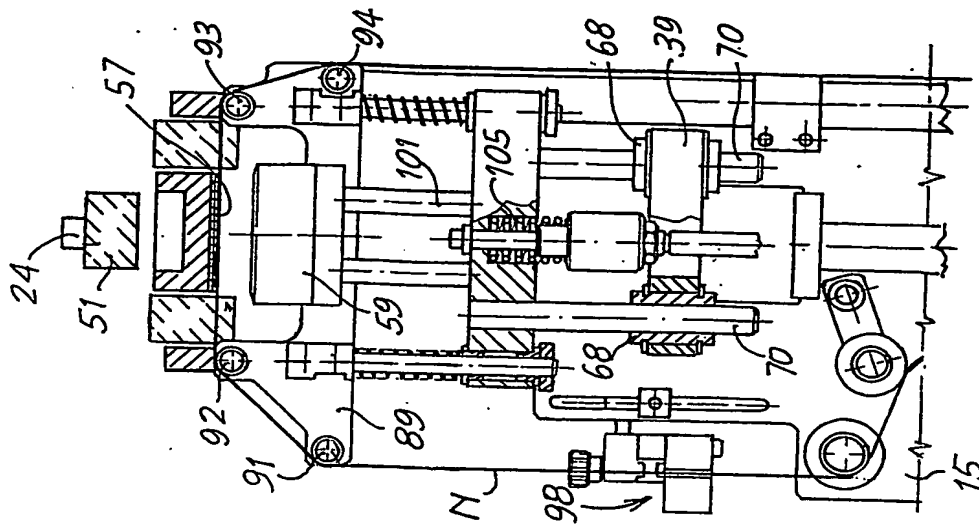


Fig.17

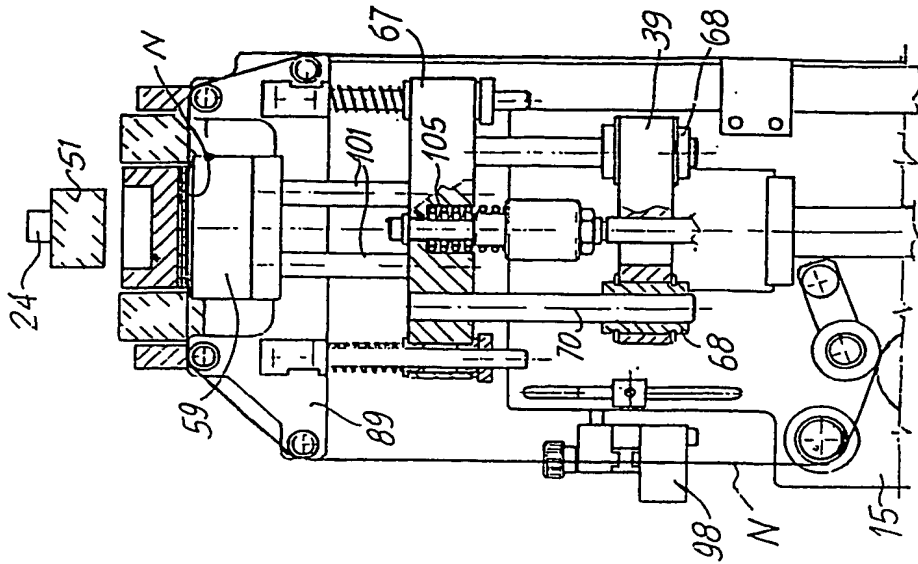


Fig. 20

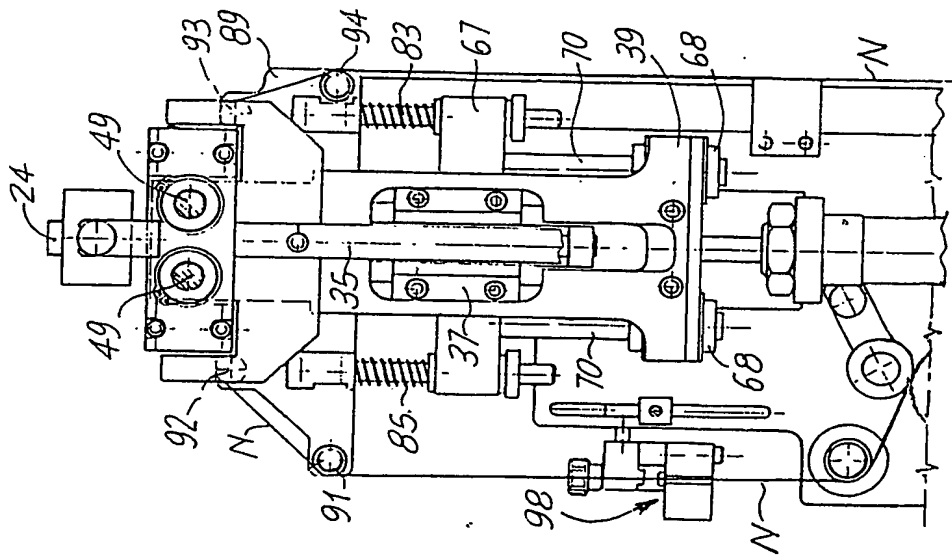


Fig. 19

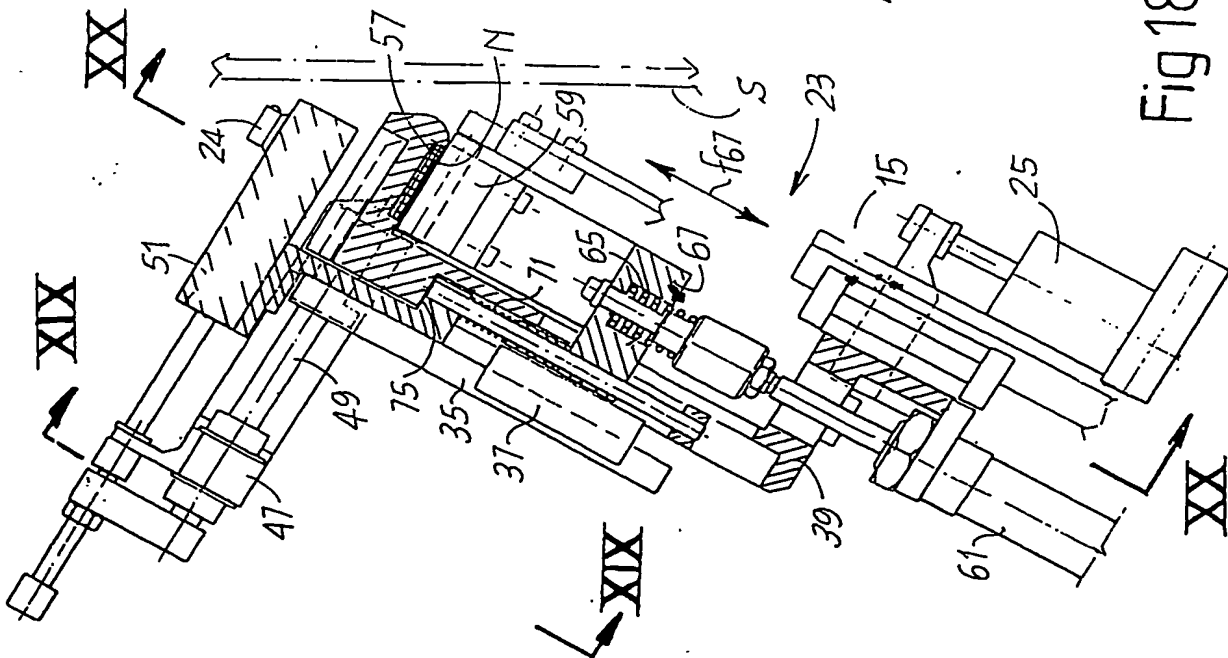


Fig 18

# INTERNATIONAL SEARCH REPORT

International Application No <b>PCT/IT 20/04000051</b>
---

**A. CLASSIFICATION OF SUBJECT MATTER**  
**IPC 7 D06H1/02**

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
**IPC 7 D06H G09F D06P B65C D05B A41B**

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**EPO-Internal, WPI Data, PAJ**

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3 024 557 A (FRENKEL MARVIN A ET AL) 13 March 1962 (1962-03-13) claim 1	1,2,6,7, 23-26
A	DE 198 58 257 A (SCHIPS AG NAEHAUTOMATION TUEBA) 21 June 2000 (2000-06-21) paragraph '0001!; claims 1,5	1,6
A	US 3 224 123 A (TEMPLETON JOHN G) 21 December 1965 (1965-12-21) claims 1,3	1,6
A	EP 0 173 593 A (CANCALON JEAN) 5 March 1986 (1986-03-05) claim 1	1

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

\* Special categories of cited documents:

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \* & \* document member of the same patent family

Date of the actual completion of the international search

**28 May 2004**

Date of mailing of the international search report

**22/06/2004**

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
 NL - 2280 HV Rijswijk  
 Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
 Fax: (+31-70) 340-3016

Authorized officer

**D'Souza, J**

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/IT 20/04000051

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 3024557	A	13-03-1962	NONE	
DE 19858257	A	21-06-2000	DE 19858257 A1 WO 0036202 A1	21-06-2000 22-06-2000
US 3224123	A	21-12-1965	NONE	
EP 0173593	A	05-03-1986	FR 2567002 A1 EP 0173593 A1 JP 61034201 A	10-01-1986 05-03-1986 18-02-1986

**This Page is Inserted by IFW Indexing and Scanning  
Operations and is not part of the Official Record**

**BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☐ FADED TEXT OR DRAWING
- ☒ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☐ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: \_\_\_\_\_

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.**